

REMARKS

As an initial matter, Applicants respectfully request the Examiner to return initialed Form PTO/SB/08 A & B (modified) for the Information Disclosure Statement filed on September 2, 2003.

In the Office Action of June 17, 2004, Claims 1-12 are rejected under 35 U.S.C. § 112, second paragraph, and under 35 U.S.C. § 103.

Claim 1 has been amended herein. Claims 13 and 14 have been added.

In Claim 1, the phrase “the tubular reactor” has been deleted and replaced with “said at least one reaction zone.” Also, the phrase “and wherein said gas containing hydrogen chloride and said gas containing oxygen are simultaneously introduced in at least the first reaction zone.” Support for amended Claim 1 can be found, for example, at page 5, lines 14-25, page 8, lines 2-6, and page 20, lines 9-12, of the specification.

New Claim 13 recites “[t]he process according to claim 1, wherein oxygen is used in an amount of 0.25 to 2 moles per one mole of hydrogen chloride.” Support for Claim 13 can be found, for example, at page 5, lines 1-5, of the specification.

New Claim 14 recites “[t]he process according to claim 1, wherein the mixed gas of hydrogen chloride and oxygen containing at least 66.7% of hydrogen chloride is introduced in the first reaction zone.” Regarding the lower limit of “66.7%,” the value was calculated from the flow rates described on page 21, lines 8-12, of the specification.

According to the data on page 21, the hydrogen chloride-containing gas (99% by volume or more) was supplied at a flow rate of 6.1 L/min and the oxygen-containing gas (99% by

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Application No. 09/889,625

volume or more) was supplied at a flow rate of 3.05 L/min. Using the following formula, the lower limit of the percentage of hydrogen chloride in the mixed gas was obtained.

$$(6.1 \text{ L/min} \times 99\%) \times 100 / (6.1 \text{ L/min} \times 99\% + 3.05 \text{ L/min}) = 66.7\%.$$

It is respectfully requested that the above amendments be entered, as it is believed that they would bring the application into condition for allowance. Upon entry of the amendment, Claims 1-14 will be pending in the application.

Response to the Rejection of Claims 1-12 under 35 U.S.C. § 112, first paragraph

Claims 1-12 have been rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is asserted that “tubular reactor” as recited in Claim 1 has no antecedent basis in the claims.

As indicated above, in Claim 1, the phrase “the tubular reactor” has been deleted and replaced with “said at least one reaction zone.” Applicants submit that the phrase “said at least one reaction zone” has proper antecedent basis in Claim 1. Accordingly, it is requested that the § 112 rejection be reconsidered and withdrawn.

Response to the Rejection of Claims 1-12 under 35 U.S.C. § 103(a)

Claims 1-12 are rejected under 35 U.S.C. § 103(a) as allegedly being unpatentable over EP 861803 (“EP ‘803”) in view of either U.S. Patent No. 4,299,977 to Kulhmann et al. (“Kulhmann”) or U.S. Patent No. 4,188,184 to Fornori (“Fornori”).

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Application No. 09/889,625

Applicants respectfully submit that the teaching of EP '803 in view of either Kuhlmann or Fornori do not render the present invention obvious. Specifically, Applicants submit that the cited prior art reference fail to teach or suggest all of the elements of the presently claimed invention.

The presently claimed process for producing chlorine is characterized in that a gas containing hydrogen chloride and a gas containing oxygen are simultaneously introduced in at least the first reaction zone.

In the process of EP '803, however, a feed stream comprising hydrogen chloride is contacted with a catalyst bed that contains a metal oxide in order to convert at least a part of the metal oxide to a metal chloride. The catalyst bed, which now contains the metal chloride, is contacted with a feed stream that contains oxygen to generate a metal oxide and chlorine (Cl_2).

Thus, the process of EP '803 is a two-step process, wherein it is necessary to alternate heating and cooling steps. Furthermore, it is necessary to change the types of gases in the feed streams that are supplied to the reaction zones. For example, in the first step, a feed stream containing hydrogen chloride is necessary and, in the second step, a feed stream containing oxygen is necessary.

In contrast, the presently claimed process, hydrogen chloride, which is present in a gas, is oxidized with a gas containing oxygen. During this reaction, it is not necessary to change the type of gas that is supplied to the reaction zones. Thus, the presently claimed process requires one step only and, as such, does not require alternating heating and cooling steps.

Applicants respectfully submit that EP '803 fails to teach or suggest simultaneously supplying a hydrogen chloride-containing gas and an oxygen-containing gas. Applicants additionally submit that this feature is also not taught or suggested by Kuhlmann or Fornori.

Applicants further submit that the process of EP '803 differs from the presently claimed process in that the material oxidized with oxygen is not hydrogen chloride but a metal oxide in a catalyst. Since it is necessary in the process of EP '803 to first form the metal chloride before supplying oxygen gas to the metal chloride, chlorine is intermittently generated.

In contrast to the process of EP '803, the presently claimed process oxidizes hydrogen chloride, which is present in a gas, with a gas containing oxygen. During this reaction, it is not necessary to change the reaction temperature, *i.e.*, it is not necessary to heat the reaction mixture. The reaction temperature is controlled by removing the heat generated by the reaction with a heat exchange system that comprises a jacket, which contains a heating medium. This heat exchange system suppresses excessive hot spots in the catalyst-packed layer. Thus, stable catalytic activity can be maintained, which allows chlorine to be produced in a constant and stable manner and at a high yield (*see* page 2, line 19 to page 3, line 3 of the description).

Applicants respectfully submit that neither Kuhlmann nor Fornori teach or suggest that stable catalytic activity can be maintained by oxidizing hydrogen chloride, which is present in a gas, with a gas containing oxygen.

For the above reasons, it is respectfully submitted that the teachings of EP '803, in view of Kuhlmann or Fornori, fail to render the present invention obvious.

AMENDMENT UNDER 37 C.F.R. § 1.116
U.S. Application No. 09/889,625

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

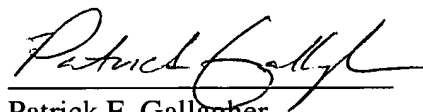
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